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International spillovers of policy uncertainty

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HIGHLIGHTS

- We estimate spillovers of policy uncertainty among six developed countries.
- Spillovers account for a high share of the dynamics of policy uncertainty.
- The US and the UK were important transmitters of policy uncertainty shocks.

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ABSTRACT

Using the Baker et al. (2013) index of policy uncertainty for six developed countries, this paper estimates spillovers of policy uncertainty. We find that spillovers account for slightly more than one-fourth of the dynamics of policy uncertainty in these countries, with this share rising to one half during the financial crisis. The US and UK are responsible for a large fraction of the spillovers since the financial crisis, while the remaining countries are all net receivers of policy uncertainty shocks during and after this period.

1. Introduction

Since the start of the financial crisis and the following Great Recession, there has been a renewed interest in the study of the impacts of uncertainty on economic activity. The highly influential paper Bloom (2009) has ignited a series of papers examining the impact of various kinds of uncertainty on economic activity (see, among others, Baker et al., 2013, Jurado et al., 2013, Leduc and Liu, 2012, Bijsterbosch and Guérin, 2013, and Caggiano et al., 2013). Within this fast expanding literature, a set of papers have examined the international transmission of uncertainty shocks. Mumtaz and Theodoridis (2012) investigate the transmission of US GDP growth volatility shocks to the UK using a structural VAR model with time-varying volatility. Also, and more related to this paper, Colombo (2013) studies the impact of US and Euro Area policy uncertainty, as measured by Baker et al. (2013), on Euro area economic activity and finds that US policy uncertainty shocks have a higher impact on Euro Area economic activity than Euro Area policy uncertainty itself, and finally, IMF (2013) studies how policy uncertainty shocks in the US and Euro area affect growth in other world regions.

In this paper, we depart from the previous literature and investigate the spillovers in policy uncertainty among a group of countries, with a focus on how policy uncertainty in one country influences uncertainty in the remaining ones. Are the dynamics of policy uncertainty in one country influenced by uncertainty shocks in other countries? What is the overall level of uncertainty spillovers among all countries in our sample? Are some countries net exporters/importers of uncertainty? To answer these questions, we use the Diebold and Yilmaz (2009, 2011) spillovers measures and policy uncertainty indices of Baker et al. (2013) for six developed countries (Canada, France, Germany, Italy, UK, and US) in order to calculate policy uncertainty spillover indices (SOI). The SOI is based on standard variance decompositions in vector autoregressions, which allows us to calculate pairwise directional

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Table 1
Correlation matrix.

	Canada	France	Germany	Italy	US	UK
Canada	1.00					
France	0.63	1.00				
Germany	0.71	0.66	1.00			
Italy	0.60	0.48	0.42	1.00		
US	0.79	0.79	0.72	0.58	1.00	
UK	0.78	0.77	0.76	0.55	0.83	1.00

Note: this table shows the correlation matrix among all policy uncertainty indices between January 1997 and September 2013.

spillovers and to aggregate them further into a consistent single measure.

Recent events offer us many examples of how policy uncertainty might spillover across countries. Following the financial crisis, the Federal Reserve implemented a series of unconventional monetary policy actions that increased the size of the Federal Reserve balance sheets to levels never seen before. Faced with a significant decline in the gross domestic product, the US Federal Government engaged in a large expansionary fiscal stimulus. These actions had important effects on capital flows, bond risk premia, and exchange rates, for example, with the potential effect of increasing policy uncertainty in other economies faced with a choice of how to react to these developments. At the same time, these economies were also hit by a negative financial shock and undertook policy actions of their own, with potential feedbacks to US policy uncertainty. It is important to note, however, that as in Diebold and Yilmaz (2009), we do not attach a causal interpretation to the word spillover, as we are unable to identify structural channels. Rather, the aim of the SOI is to simply highlight the overall and pairwise directional connectedness among all countries in the sample.

We find a high degree of policy uncertainty spillovers. For most countries, around 35% of the volatility of their policy uncertainty shocks can be explained by shocks originating in other countries. Moreover, we find that policy uncertainty spillovers are highly countercyclical, having risen sharply during the last financial crisis. We are also able to show which countries are transmitting uncertainty shocks, as well as receiving it most. We show that since the financial crisis and Great Recession, the UK and specially the US have been strong net exporters of policy uncertainty shocks, while the remaining countries have been net importers of policy uncertainty shocks.

This paper proceeds as follows. First, we describe the methodology for calculating spillovers. Section 3 describes the dataset. We then follow with the results, and finally, Section 5 concludes.

2. Methodology

We use the methodology for construction of spillover measures suggested by Diebold and Yilmaz (2009), with an algorithm created by Klößner and Wagner (2014) to calculate robust spillover measures.

Consider an N-dimensional VAR(p) model, $Y_t = \Phi_1 Y_{t-1} + \cdots + \Phi_p Y_{t-p} + \epsilon_t$, where ϵ_t is an i.i.d. shock. The coefficient matrices $\Phi_1, \ldots, \Phi_p$ summarize all the dynamic relationships among the variables. By stationarity, the system above has a moving average representation $Y_t = \epsilon_t + A_1\epsilon_{t-1} + A_2\epsilon_{t-2} + \cdots$. Let $P(Y_{t+H}|Y_t, Y_{t-1}, \ldots)$ be the H-step ahead forecast at time t. Diebold and Yilmaz (2009) summarize the information contained in the coefficient matrices in spillover measures with H-step ahead forecast error variance decompositions

$$Y_{t+H} - P(Y_{t+H}|Y_t, Y_{t-1}, \ldots) = \epsilon_{t+H} + A_1\epsilon_{t+H-1} + A_2\epsilon_{t+H-2} + \cdots + A_{H-1}\epsilon_{t+1}. \quad (1)$$

Letting Σ_ϵ be the covariance matrix of ϵ and $A_0 := I_N$, the forecast error's covariance matrix is given by $\Sigma_{\epsilon,H} = \sum_{h=0}^{H-1} A_h \Sigma_\epsilon A_h'$.

Following Diebold and Yilmaz (2009), we make use of the lower-triangular Cholesky factor L of the Σ_ϵ matrix, i.e. the lower-triangular matrix L such that $LL' = \Sigma_\epsilon$. Using L, $A_h\Sigma_\epsilon A_h'$ can be written as $(A_hL)(A_hL)'$, and hence $(A_h\Sigma_\epsilon A_h')_{ii} = \sum_{j=1}^{N}(A_hL)_{ij}^2$ for variable i's forecast error variance. Thus, $\sum_{h=0}^{H-1}(A_hL)_{ij}^2$ can be considered as the contribution of shocks to variable j to variables i's forecast error variance. Diebold and Yilmaz (2009) summarize all the information on the various spillovers into a single number, a spillover index (SOI):

$$\mathrm{SOI} := 100 \times \frac{1}{N}\sum_{i=1}^{N}\frac{\sum_{i\neq j}\sum_{h=0}^{H-1}(A_hL)_{ij}^2}{\sum_{h=0}^{H-1}(A_h\Sigma_\epsilon A_h')_{ii}} = 100 \times \left(1 - \frac{1}{N}\sum_{i=1}^{N}\frac{\sum_{h=0}^{H-1}(A_hL)_{ii}^2}{\sum_{h=0}^{H-1}(A_h\Sigma_\epsilon A_h')_{ii}}\right). \quad (2)$$

The spillover index is invariant to rescaling of the variables. Assuming that all variables have been scaled such that their respective forecast error is equal to unity, one can replace (1) with the following more straightforward formula

$$\mathrm{SOI} = 100 \times \left(1 - \frac{1}{N}\mathrm{tr}\left(\sum_{h=0}^{H-1}(A_hL)^{\boxed{2}}\right)\right) \quad (3)$$

with the operator $(\cdot)^{\boxed{2}}$ which squares a matrix elementwise.

As it is widely known, the Cholesky decomposition is not invariant to the ordering of the Σ_ϵ matrix. Different orderings may thus result in significantly different spillover estimates, as shown by Klößner and Wagner (2014). We thus apply their proposed algorithm to conveniently calculate robust spillover measures by averaging the results over all possible permutations of the system.[1] We refer the reader to their paper for a detailed exposition of their algorithm.

3. Data

The policy uncertainty measures are readily available at the policy uncertainty website.[2] Our sample is monthly for the period of January 1997 to September 2013 and comprises the following countries: Canada, France, Germany, Italy, UK, and US. The indices are based on a weighted average of a news based measure of uncertainty and forecast disagreement among professional forecasters. For a more detailed explanation of how the indices were constructed for each country, we refer the reader to Baker et al. (2013) and their policy uncertainty website.

Fig. 1 plots the data and Table 1 presents the correlation matrix for the policy uncertainty indices in the various countries. The highest pairwise correlation is between the US and the UK, at 83%. Italy is the country with the smallest average pairwise correlation with the other countries. The figure indicates a significant comovement among policy uncertainty measures in the different countries. For all countries in the sample, though to varying degrees, there is a rise in uncertainty around 2001, possibly following the dotcom bubble burst in the US, as well as the following recession. The next notable following spikes are the 2008 financial crisis, Great Recession, as well as a significant spike at the end of 2012. For all countries in our sample, policy uncertainty is significantly higher and more volatile after the financial crisis than in the beginning of the sample.

[1] With 6 countries in our sample, we have 720 different orderings.

[2] http://www.policyuncertainty.org.